

## REGIONAL COMPETITION - ROUND 10

### TOSS-UP

1. GENR; Multiple Choice: A new clock has been built by the National Institute of Standards and Technology which is ten times more accurate than the old model. Scientists expect the new clock to be accurate to 1 second in how many years?  
  
a) 3000  
b) 300,000  
c) 3 million  
d) 30 million

ANSWER: C--3 MILLION

### BONUS

1. GENR; Short Answer: New names have now been picked for elements 107, 108 and 109. Name any two of them.

ANSWER: NIELSBOHRUM, HESSIUM, AND MEITNERIUM

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### TOSS-UP

2. PHYS; Short Answer: There is direct evidence for quarks of how many flavors?

ANSWER: FIVE (5)

### BONUS

2. PHYS; Short Answer: A string of length  $L$  is fixed between two points. If a standing wave of 5 nodes is produced, what is the relationship between the string's length,  $L$ , and its wavelength?

ANSWER: WAVELENGTH =  $1/2 L$

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### **TOSS-UP**

3. BIOL; Short Answer: The production of antibodies is triggered by the proteins on the surfaces of invasive organisms. What are these proteins called?

ANSWER: ANTIGENS

### **BONUS**

3. BIOL; Short Answer: What type of cell division produces germinal cells which have only half the DNA content of the parent cell?

ANSWER: MEIOSIS (MY-OSIS)

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### **TOSS-UP**

4. ASTR; Multiple Choice: The individual stars visible to the naked eye are:
- a) evenly distributed throughout the universe
  - b) situated only in our Milky Way galaxy
  - c) situated only in galaxies and nebula in the universe
  - d) situated only in nebula

ANSWER: B--SITUATED ONLY IN OUR MILKY WAY GALAXY

### **BONUS**

4. ASTR; Multiple Choice: In the realm of celestial objects, which occurs?
- a) Nebulas in galaxies
  - b) Galaxies in nebulas
  - c) Galaxies in globular clusters
  - d) Milky Way in galaxies

ANSWER: A--NEBULAS IN GALAXIES

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**TOSS-UP**

5. CHEM: Multiple Choice: What is the formula for chloric acid?

- a)  $\text{HClO}$
- b)  $\text{HClO}_2$
- c)  $\text{HClO}_3$
- d)  $\text{HClO}_4$

ANSWER: C--  $\text{HClO}_3$

**BONUS**

5. CHEM; Short answer: Chloric acid is such a strong oxidizing agent that it will oxidize itself upon heating. Give the three products of this self oxidation.

ANSWER:  $\text{H}_2\text{O}$   $\text{ClO}_2$   $\text{HClO}_4$

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**TOSS-UP**

6. COMP; Short Answer: What is the octal representation of the decimal number 7?

ANSWER: SEVEN (7)

**BONUS**

6. COMP; Short Answer: What is the binary representation of the decimal number 7?

ANSWER: 111 (00000111 WOULD ALSO BE ACCEPTABLE, OR ANY NUMBER OF LEADING ZEROS)

**TOSS-UP**

7. BIOL; Short Answer: Where are proteins secreted from a cell stored?

ANSWER: VESICLES

**BONUS**

7. BIOL; Short Answer: What is the process by which a cell excretes vesicles called?

ANSWER: EXOCYTOSIS

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**TOSS-UP**

8. PHYS; Short Answer: The dark lines constituting the absorption spectrum exhibited by sunlight are frequently called:

ANSWER: FRAUNHOFER LINES

**BONUS**

8. PHYS; Short Answer: What is the wavelength in meters of an AM radio wave at 1000 kilohertz?

ANSWER: 300 METERS

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### TOSS-UP

9. ERSC; Multiple Choice: Of the following types of clouds which is the only one that would be found in the stratosphere?
- a) cumulus
  - b) cumulonimbus
  - c) altostratus
  - d) altocumulus

ANSWER: B--CUMULONIMBUS

### BONUS

9. ERSC; Multiple Choice: If a straight hole was drilled through the center of the earth, starting at Springfield, Illinois, where would it come out at the other end?
- a) China
  - b) Indian Ocean
  - c) Australia
  - d) Pacific Ocean

ANSWER: B-- INDIAN OCEAN

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### TOSS UP

10. CHEM; Multiple Choice: Which one of the following elements does NOT exist in more than one allotropic form at standard temperature and pressure?
- a) oxygen
  - b) bismuth
  - c) sulfur
  - d) arsenic

ANSWER: B--BISMUTH

### BONUS

10. CHEM; Short answer: How many grams of sodium hydroxide must be contained in 2 liters of a .1 molar solution of sodium hydroxide in water?

ANSWER: 8 GRAMS

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**TOSS-UP**

11. BIOL; Multiple Choice: Which of the following distinguishes eukaryotes from prokaryotes?
- a) organelles present in the cytoplasm
  - b) genetic material in the form of DNA
  - c) the presence of a nucleus
  - d) the ability of carry-out photosynthesis

ANSWER: THE PRESENCE OF A NUCLEUS

**BONUS**

11. BIOL; Short Answer: Chromosomes have structure and organization, what are the terminal ends called?

ANSWER: TELEMOMERES

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**TOSS-UP**

12. CHEM; Multiple Choice: In spectrophotometry, the absorbance is defined as:
- a) the ratio of transmitted light to incident light
  - b) the number of photons of light absorbed
  - c) the logarithm of the absorptivity
  - d) the negative logarithm of the transmittance

ANSWER: D--THE NEGATIVE LOGARITHM OF THE TRANSMITTANCE

**BONUS**

12. CHEM; Multiple Choice: An acetal compound is formed by reaction of:
- a) an alcohol and a ketone
  - b) an aldehyde and an alcohol
  - c) an aldehyde and a ketone
  - d) a carboxylic acid and a ketone

ANSWER: B--AN ALDEHYDE AND AN ALCOHOL

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**TOSS-UP**

13. MATH; Short Answer: On a scalene triangle, how many side have equal length?

ANSWER: NONE

**BONUS**

13. MATH; Multiple Choice: A plane curve generated by a point moving so that its distance from a fixed point is equal to its distance from a fixed line is a:
- a) Ellipse
  - b) Parabola
  - c) Hyperbola
  - d) Straight line

ANSWER: B--PARABOLA

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**TOSS-UP**

14. GENR; Multiple Choice: Dioxin is normally produced during the manufacturing of which of the following products?
- a) steel
  - b) cement
  - c) paper
  - d) seimconductors

ANSWER: C--PAPER

**BONUS**

14. GENR; Multiple Choice: How many 25 kilowatt wind-powered generators would have to be built to replace all of the power plants in the United States which provide electricity today?
- a) 1000
  - b) 200,000
  - c) 2 million
  - d) 22 million

ANSWER: D--22 MILLION

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**TOSS-UP**

15. BIOL; Multiple Choice: Which of the following is a component of plant cells but not animal cells?
- a) vacuoles
  - b) lysosomes
  - c) centrioles
  - d) plastids

ANSWER: D--PLASTIDS

**BONUS**

15. BIOL; Short Answer: Within a plant and/or animal cell exists a transportation system for exporting proteins and/or lipids. Name the part of the cell where the export of synthesized proteins and/or lipids starts.

ANSWER: ENDOPLASMIC RETICULUM

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**TOSS-UP**

16. ASTR; Multiple Choice: The maximum number and minimum number of total solar eclipses per year respectively are:
- a) 3 and 0
  - b) 3 and 1
  - c) 2 and 0
  - d) 1 and 1

ANSWER: A--3 AND 0

**BONUS**

16. ASTR; Multiple Choice: What is the ratio of total solar to total lunar eclipses per year?
- a) Lunar eclipses outnumber solar eclipses approximately 2 to 1
  - b) Solar eclipses outnumber lunar eclipses approximately 3 to 2
  - c) Lunar and solar eclipses occur 1 to 1
  - d) Solar eclipses outnumber lunar eclipses exactly 5 to 2

ANSWER: B--SOLAR ECLIPSES OUTNUMBER LUNAR ECLIPSES APPROXIMATELY 3 TO 2

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### TOSS-UP

17. PHYS; Short Answer: Two identical resistors are connected in parallel and consume 200 watts together from a constant voltage source. A third identical resistor is added in parallel. The total power consumed is:

ANSWER: 300 WATTS

### BONUS

17. PHYS; Multiple Choice: Which of the following units of energy is the smallest:
- a) calorie
  - b) Joule
  - c) erg
  - d) kilowatthour

ANSWER: C--ERG

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### TOSS-UP

18. CHEM; Short answer: What is the third most abundant component of dry air?

ANSWER: ARGON

### BONUS

18. CHEM; Short answer: A sample of argon occupies a volume of 6 liters at 27C and 5 atm. What will the volume of the argon be at 127C and 2 atm?

ANSWER: 20 liters

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**TOSS-UP**

19. ERSC; Short Answer: Expeditions to Antarctica usually leave from the city of Christchurch. In what country is it located?

ANSWER: NEW ZEALAND

**BONUS**

19. ERSC; Short Answer: What is the deepest freshwater lake on earth?

ANSWER: LAKE BAIKAL (IN SIBERIA)

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**TOSS-UP**

20. COMP; Short Answer: What is the binary equivalent of the decimal number 13?

ANSWER: 1101 (00001101 WOULD ALSO BE ACCEPTABLE)

**BONUS**

20. COMP; Short Answer: What control character is typically used within the MS-DOS operating system to represent the end-of-file condition?

ANSWER: CONTROL-Z

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**TOSS-UP**

21. BIOL; Multiple Choice: When looking at a cell under an electron microscope you see the chromatic pairs arranged at the midplane of the cell. Which stage of mitosis is the cell in?
- a) late anaphase
  - b) mid prophase
  - c) metaphase
  - d) early metaphase

ANSWER: C--METAPHASE

**BONUS**

21. BIOL; Short Answer: Name the end product of Anaerobic Glycolysis which is responsible for muscle soreness.

ANSWER: LACTIC ACID

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**TOSS-UP**

22. MATH; Short Answer: 88% is what fraction when reduced to lowest terms?

ANSWER: 22/25

**BONUS**

22. MATH; Short Answer: In a right triangle what is the side adjacent to an angle divided by the side opposite the angle called?

ANSWER: COTANGENT

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**TOSS-UP**

23. PHYS; Short Answer: To create an enlarged real image using a concave mirror, the object must be placed:

ANSWER: BETWEEN THE CENTER AND THE FOCUS

**BONUS**

23. PHYS; Multiple Choice: What is the theoretical limit of the efficiency of a single-crystal single-junction cell in a solar photovoltaic system?
- a) 9 percent
  - b) 29 percent
  - c) 79 percent
  - d) 99 percent

ANSWER: B--29 PERCENT

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**TOSS-UP**

24. CHEM; Short answer: What is the chemical formula for calcium chromate?

ANSWER:  $\text{CaCrO}_4$

**BONUS**

24. CHEM; Short answer: The decomposition of a salt by water to form an acid and a base is known as what?

ANSWER: HYDROLYSIS

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### TOSS-UP

25. PHYS; Short Answer: If materials become superconducting when cooled, any magnetic field will be expelled. What effect is this called?

ANSWER: THE MEISSNER EFFECT

### BONUS

25. PHYS; Multiple Choice: One of the particles expected to be discovered at the cancelled Superconducting Super Collider was the:

- a) Higg's boson
- b) tau meson
- c) tachyon
- d) anti-proton

ANSWER: A--HIGG'S BOSON

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